

# Work Order ID 83698

**\*83698\***

Page 1

May-30-12 7:56:41 AM

Item ID: D350-748-201

Accept

**\*N900040100\***

Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Crosstube Installation, High Aft

Start Date: 4/23/12 Start Qty: 1.00 **\*1\***

Cust Item ID:

Required Date: 5/07/12 Req'd Qty: 1.00 **\*1\***

Customer:

Reference:

Run Start **\*NR1\***

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Stop **\*NR2\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

Draw Nbr	Revision Nbr
D350-748-241	F

100

**\*100\***

DC

Document Control

DOCUMENT CONTROL

Memo

Photocopy bluefile & type labels per PPPD350-748-201 CHG002

0.00

0.00

110

**\*110\***

CNC Bend 2

CNC Alpha 160 Bender

BENDING MACHINE - CROSSTUBES

Memo

Bend tube as per Dwg D350-748-241 using CNC bender program D350A and Folio FT

0.00

0.00

120

**\*120\***

QC

Quality Control

QC15- Crosstube Dimensional Check

Memo

Issue P/O to Met cor P/O: 16954 CH12106104 12-5-10  
Rec'd + inspect attached cofc to W/O

0.00

0.00

5/16/09

*[Handwritten signature]*

12-5-9

12-5-25

*[Handwritten signature]*

**\*83698\***

May-30-12 7:56:41 AM

**\*N900040100\***

Stop \*NS2\*

**Reference:**

Stop \*NR2\*

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

125

**\*125\***

HandFXtube

## Hand Finishing Crosstubes

## Memo

\*\*\*Stress relief\*\*\*

Heat treat crosstube as per QSI010 4.3

Temp: \_\_\_\_\_

Start time: \_\_\_\_\_

Finish time: \_\_\_\_\_

127

QC5- Inspect part completeness to step on W/O

**\*127\***

QC

## Quality Control

## Memo

0.00

0.00

**Work Order ID 83698****\*83698\***

Page 3

April-23-12 4:00:38 PM

Item ID: D350-748-201

Accept

**\*N900040100\***Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Crosstube Installation, High Aft

Start Date: 23/04/2012 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 07/05/2012 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start **\*NR1\***

QC:

Date:

SPC (Y/N):

Date:

Stop **\*NR2\***Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

130

0.00

**\*130\***

Crosstubes

0.00

Crosstubes

Memo

1-Drill Tube as per Dwg D350-748-241 Using DT8876 Drill Jigs,  
Set-up drill table as per QSI 010

Crosstubes

2-Deburr

3-Engrave Part # and Batch # as per Dwg D350-748-241

4-Remove all marks from tube within limits of D350-748-241

5- Apply a light coat of LPS3 on the interior of tube

Batch: 1145

140

QC6- Inspect dimensions to drawing

0.00

**\*140\***

QC

Memo

0.00

Quality Control

MO/RM

12-5-23

12.05.10

CP

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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NOTE: Date & initial all entries

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April-23-12 4:00:38 PM

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Item Name: Crosstube Installation, High Aft

Stop \*NS2\*

Start Date: 23/04/2012 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 07/05/2012 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start \*NR1\*

QC:

Date:

SPC (Y/N):

Date:

Stop \*NR2\*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
150	Outsource process-Cadplate per QSI017 4.1.9.1	0.00							
<b>*150*</b>									
Outsource3	Memo	0.00							
Outsource process - Cad plate	Issue P/O: <u>17084</u> Stress relief at 375° for 5 hours Magnetic Particle Inspect per ASTM E1444 Cadium Plate per AMS-QQ-P-416B, Class 1, Type 2 Embrittle relief at 375° for 8 hours, Chromate Treat Possibe Supplier: Southwest United Industries Ensure Certificate of Conformity is attached								
160	Receive & Inspect for Damage & Mat'l Certs	0.00							
<b>*160*</b>									
Packaging	Memo	0.00							
Packaging	Ensure certificate of conformity is attached								
170	QC5- Inspect part completeness to step on W/O	0.00							
<b>*170*</b>									
QC	Memo	0.00							
Quality Control									

CZ 12/06/04 (1)

P 12/6/18 (1)

★ SEE W/O CHG ATTACHED

S.12/06/19

NDT

P/O: 17258

CZ 12/06/19 x1

rec'd.

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector
11.10.13	161	LOAD TUBE TO 3000 <sup>lb</sup> FOR 1 MINUTE  REF D.S. EMAIL		GP 12/6/14	1	GP 12/6/14	
11.10.13	162	NDT TUBE					

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

## Chris Provencal

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**From:** David Shepherd <dshepherd@dartaero.com>  
**Sent:** Tuesday, April 27, 2010 3:40 PM  
**To:** 'Mike Petsche'  
**Cc:** 'Bill Beckett'; 'L Lacelle'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com  
**Subject:** 350 crosstubes

Mike,

I discussed the 350 crosstube load testing with Bill a little while ago and this plan makes sense to him.

So, my recommendation to clear these crosstubes is to load the fwd crosstubes to 3500 lb and the aft crosstubes to 3000 lb in the deflection test rig and document on the work orders that this test has been completed. Hold max load for 1 minute. Per TP-D350-748-2, these loads represent the maximum load on these crosstubes at gross weight and are below the yield point of the material. I would like to request that Chris Provencal witness these tests and sign off the work orders based on his experience with Dart landing gears. My feeling is that if there is a problem with the parts, it will manifest itself during this load test. I, for one, would feel a lot more confident in testing each crosstube in this manner than relying totally on what Exova has to say. I think it would be very difficult to reach a conclusion on the whole batch on the basis of cracks in two parts from the batch.

I believe that we can accomplish this before next Friday, which also gives us time to hear what Exova has to say in case it has an impact on our decision. So far, what I have seen from Exova shows me that there are fluctuations in the heat treating but the tubes are heat treated to our specification.

For this reason, I believe we should tell DHS that it looks like we will be able to start shipping 350 crosstubes by May 7th pending a successful Engineering test of the material.

David.



# Work Order ID 83698

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Accept

\*N9000040100\*

Setup Start \*NS1\*

Revision ID:

Stop \*NS2\*

Item Name: Crosstube Installation, High Aft

Start Date: 23/04/2012 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 07/05/2012 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_

Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start \*NR1\*

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop \*NR2\*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

180

0.00

\*180\*

SprayPaint

SprayPaint

Memo

0.00

Spray Painting

1-Prime inside crosstube as per QSI 005 4.2  
2-Paint Outside of Tube as per Dart QSI 005 4.2

1

12.06.19

190

QC14- Inspect Spray Paint

0.00

\*190\*

QC

Memo

0.00

Quality Control

Then, Wrap in plastic bag to protect from scratches

①

②

12.06.22

200

0.00

\*200\*

Crosstubes

Crosstubes

Memo

0.00

Crosstubes

1-Install Ground wire Insert, then insert screw and washer  
2-Install Abrasion strips as per Dwg D350-748-241 & QSI 035.  
3-Install supports Using Dt8876 as per Dwg D350-748-241, Torque to 60-80 IN-LBS

AD

12-6-22

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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**NOTE:** Date & initial all entries

**Work Order ID 83698****\*83698\***

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**\*N900040100\***

Setup Start

**\*NS1\***

Revision ID:

Stop

**\*NS2\***

Item Name: Crosstube Installation, High Aft

Start Date: 23/04/2012 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 07/05/2012 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Run Start

**\*NR1\***

Approvals:

Process Plan:

Date:

Tooling:

Date:

Stop

**\*NR2\***

QC:

Date:

SPC (Y/N):

Date:

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

210

QC5- Inspect part completeness to step on W/O

0.00

**\*210\***

QC

Memo

0.00

Quality Control

12/06/24

220

Pick Kit

0.00

**\*220\***

Packaging

Memo

0.00

Packaging

12/06/228

230

QC4- 100% Inspect kits for completeness

0.00

**\*230\***

QC

Memo

0.00

Quality Control

12/06/25

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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**NOTE:** Date & initial all entries

# Work Order ID 83698

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April-23-12 4:00:38 PM

Item ID: D350-748-201

Accept

\*N9000040100\*

Setup Start

\*NS1\*

Revision ID:

Stop

\*NS2\*

Item Name: Crosstube Installation, High Aft

Start Date: 23/04/2012 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 07/05/2012 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Approvals: Process Plan:

Date:

Tooling:

Date:

Run Start

\*NR1\*

QC:

Date:

SPC (Y/N):

Date:

Stop

\*NR2\*

Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Tool ID

Tool #

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

240

0.00

\*240\*

Packaging

0.00

Packaging

Memo

Identify and pack for shipping as per PPPD350-748-201

Location:

PPP Rev: B

*12/10/25*

250

QC21- Final Inspection - Work Order Release

0.00

\*250\*

QC

Memo

0.00

Quality Control

*MLJ 12/10/25*

*ME 12-06-25*

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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**NOTE:** Date & initial all entries

# Picklist Print

April-23-12 4:00:42 PM

Page 1

Work Order ID: 83698

\*83698\*

Parent Item: D350-748-201

\*D350-748-201\*

Parent Item Name: Crosstube Installation, High Aft

Start Date: 23/04/2012

Required Date: 07/05/2012

Start Qty: 1.00

Required Qty: 1.00

## Comments:

IPP Rev: A New Issue 06-07-05 JLM  
 IPP Rev: B Update qty of MS21042L5 06-09-12 KJ  
 IPP Rev C Combined manufacturing 08.04.02 EC verified by: DD  
 IPP Rev:D 08-06-24 revD as per dwg DD verified by:EC  
 IPP Rev: E 08.12.11 Step17 was step 21 KJ Verified by:EC IPP Rev:F  
 10.08.04 added QSI010 4.3 DD verf:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D350-748-241TRN		Manufactured	No			110	Each	1.0000	1	1			
*D350-748-241TRN*									**				
Crosstube Turning Detail													

B79391

TW 12-5-9

Location	Loc Qty	Loc Code
LG	1	
61314	0	
61315	0	
83287	1	

ALS4-1032-225

Purchased

No

200

Each

1,850.000

1

1

\*AI S4-1032-225\*

\*\*

AG 12-6-22

Insert

Location	Loc Qty	Loc Code
ST281	1827	
108696	146	
110768	62	
118386	55	
118966	68	
121269	1496	
ST282	23	
120410	10	
120451	13	

AN960JD10

NAS1149D0363J Purchased

No

200

Each

0.0000

1

1

\*AN960.ID10\*

\*\*

121524

AG 12-6-22

Washer

①

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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Page 2

Work Order ID: 83698

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Parent Item: D350-748-201

\*D350-748-201\*

Parent Item Name: Crosstube Installation, High Aft

Start Date: 23/04/2012

Required Date: 07/05/2012

Start Qty: 1.00

Required Qty: 1.00

D2856-400

Manufactured No

200 f

353.5345

1.181

1.243158

\*D2856-400\*

Abrasion Strip

\*\*

AP 12-6-22

## Location

## Loc Qty

## Loc Code

ST403

216

81875

216

ST409

137.5345

63735

0.6696

68076

0.3149

71164

8.46

79551

128.09

1.2

1- cut as per dwg D2856

D3502-1

Manufactured No

200 Each

39.0000

2

2

\*D3502-1\*

Support

\*\*

AP 12-6-22

## Location

## Loc Qty

## Loc Code

ST051

39

73419

19

74873

20

MS21920-20

Purchased No

200 Each

128.0000

2

2

\*MS21920-20\*

Clamp (per MIL-DTL-8783C)

\*\*

AP 12-6-22

## Location

## Loc Qty

## Loc Code

LG050

128

116799

8

120676

20

121067

50

121274

50

2

April-23-12 4:00:42 PM

Shop Packet Print

Page 2

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

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Parent Item Name: Crosstube Installation, High Aft

Start Date: 23/04/2012

Required Date: 07/05/2012

Start Qty: 1.00

Required Qty: 1.00

MS27039-1-10

Purchased

No

200

Each

186.0000

1

1

\*MS27039-1-10\*

Screw

122027

\*\*

①

AL 12-6-22

Location

Loc Qty

Loc Code

GA

100

120449

100

ST291

86

120120

86

AN4-41A

Purchased

No

220

Each

583.0000

8

8

\*AN4-41A\*

Bolt

\*\*

①  
M12/573

Location

Loc Qty

Loc Code

360

181

121185

181

ST360

402

115108

3

115705

7

117619

27

118451

50

118838

50

119328

100

120423

150

121205

15

AN4-6A

Purchased

No

220

Each

1,497.0000

16

16

\*AN4-6A\*

Bolt

\*\*

7  
12/6/22

Location

Loc Qty

Loc Code

ST356

1497

119017

997

121243

500

16

April-23-12 4:00:42 PM

Shop Packet Print

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W/O:		WORK ORDER CHANGES					
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Parent Item: D350-748-201

**\*D350-748-201\***

Parent Item Name: Crosstube Installation, High Aft

Start Date: 23/04/2012

Required Date: 07/05/2012

Start Qty: 1.00

Required Qty: 1.00

AN5-32A Purchased

No

220

Each

204.0000

4

4

**\*AN5-32A\***

\*\*

Bolt

Location

Loc Qty

Loc Code

ST339

204

119328

39

119862

50

120423

75

120910

30

121415

10

AN960JD416 NAS1149D0463J Purchased

No

220

Each

10.0000

32

32

**\*AN960.ID416\***

\*\*

Washer

Location

Loc Qty

Loc Code

ST351

10

116289

10

AN960JD516 NAS1149D0563J Purchased

No

220

Each

0.0000

8

8

**\*AN960.ID516\***

\*\*

Washer

D3500-1

Manufactured

No

220

Each

99.0000

4

4

**\*D3500-1\***

\*\*

Saddle

Location

Loc Qty

Loc Code

ST423

14

78595

14

ST424

55

73405

20

73406

8

76000

27

ST425

30

76940

30

April-23-12 4:00:42 PM

Shop Packet Print

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W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Picklist Print

April-23-12 4:00:42 PM

Page 5

Work Order ID: 83698

\*83698\*

Parent Item: D350-748-201

\*D350-748-201\*

Parent Item Name: Crosstube Installation, High Aft

Start Date: 23/04/2012

Required Date: 07/05/2012

Start Qty: 1.00

Required Qty: 1.00

D3501-1

Manufactured No

220 Each

360.0000 16 16

\*D3501-1\*

Bushing

\*\*

72 92 30  
B8544 B83253

## Location

## Loc Qty

## Loc Code

ST051

360

67757

4

70682

82

73391

6

74866

207

77033

61

MS21042L4

Purchased

No

220 Each

6,008.000 24 24

\*MS21042L 4\*

Nut

\*\*

## Location

## Loc Qty

## Loc Code

ST300

6008

116188

5

119017

4

119075

999

121011

2000

121444

3000

MS21042L5

Purchased

No

220 Each

1,351.000 4 4

\*MS21042L 5\*

Nut

\*\*

## Location

## Loc Qty

## Loc Code

ST300

1351

116105

5

116548

43

117611

30

119109

1273

April-23-12 4:00:42 PM

Shop Packet Print

Page 5

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

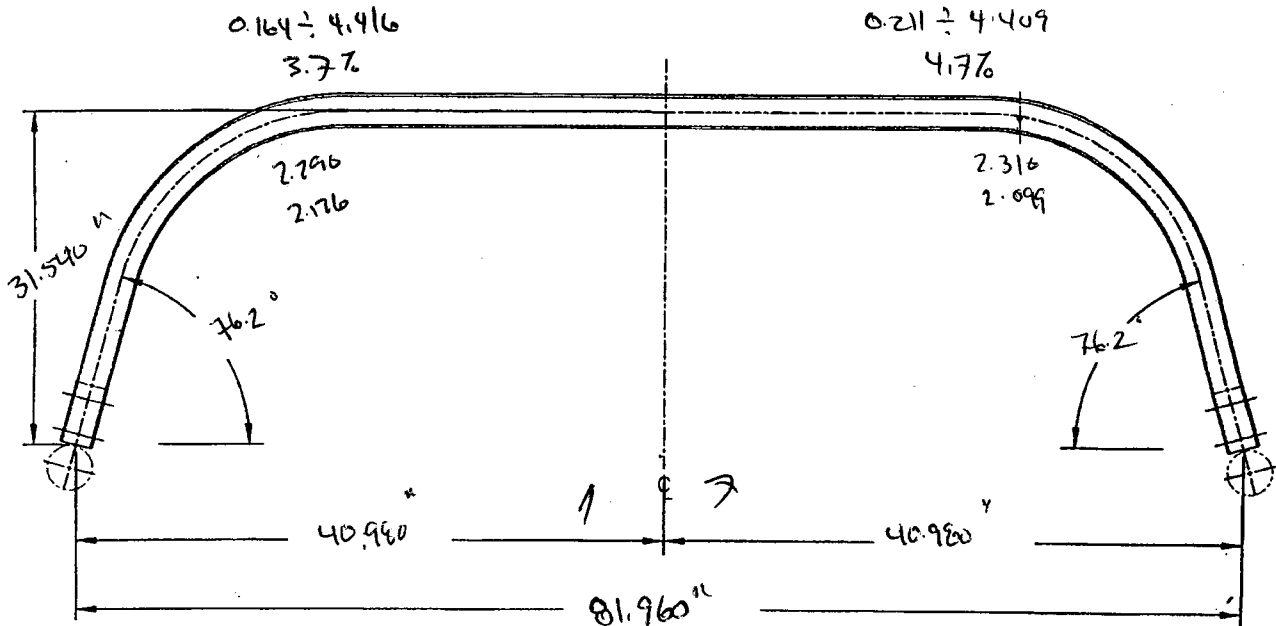
NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries



DART AEROSPACE LTD		Work Order:	83698
Description: Crosstube High Aft (AS350/355)		Part Number:	D350-748-201
Inspection Dwg: D350-748-241	Rev: E F <i>FGP</i>	Page 1 of 1	

Required Dimension	Min	Max
Height	31.22	31.48
1/2 Span	40.77	41.03
Angle	75	77
Total Span	81.54	82.06



Comments	
Side A =	3.7% crushing @ 11 passes b.
Side B =	4.7% crushing @ 7 passes
Twist =	0.171
Tube is	kinked OK if 12.05.23 JPS101V

QC15 Inspection	<i>12.06.25</i>
Date	

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	<i>[Signature]</i>

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

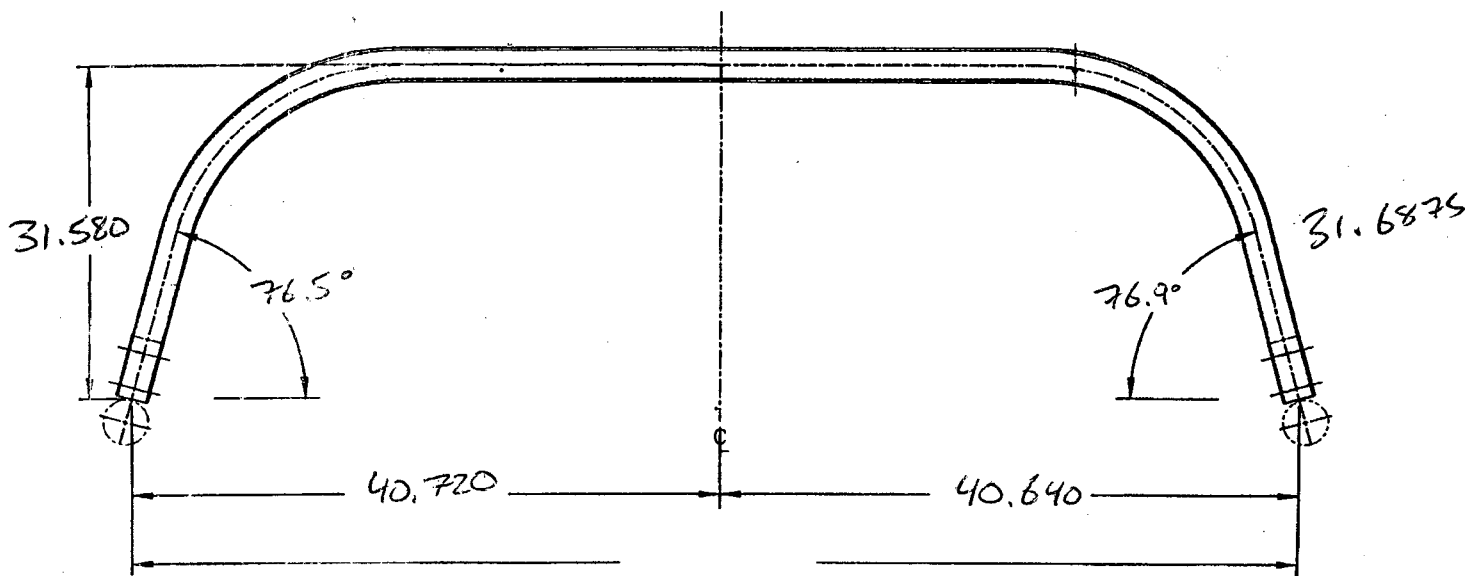
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NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	83698
Description: Crosstube High Aft (AS350/355)		Part Number:	D350-748-201
Inspection Dwg: D350-748-241 Rev: E		Page 1 of 1	

Required Dimension	Min	Max
Height	31.22	31.48
1/2 Span	40.77	41.03
Angle	75	77
Total Span	81.54	82.06



MO 12-5-17

Comments
Twist = 0
Acceptable (Pr. vs. 17) (PS) 012

QC15 Inspection	
Date	

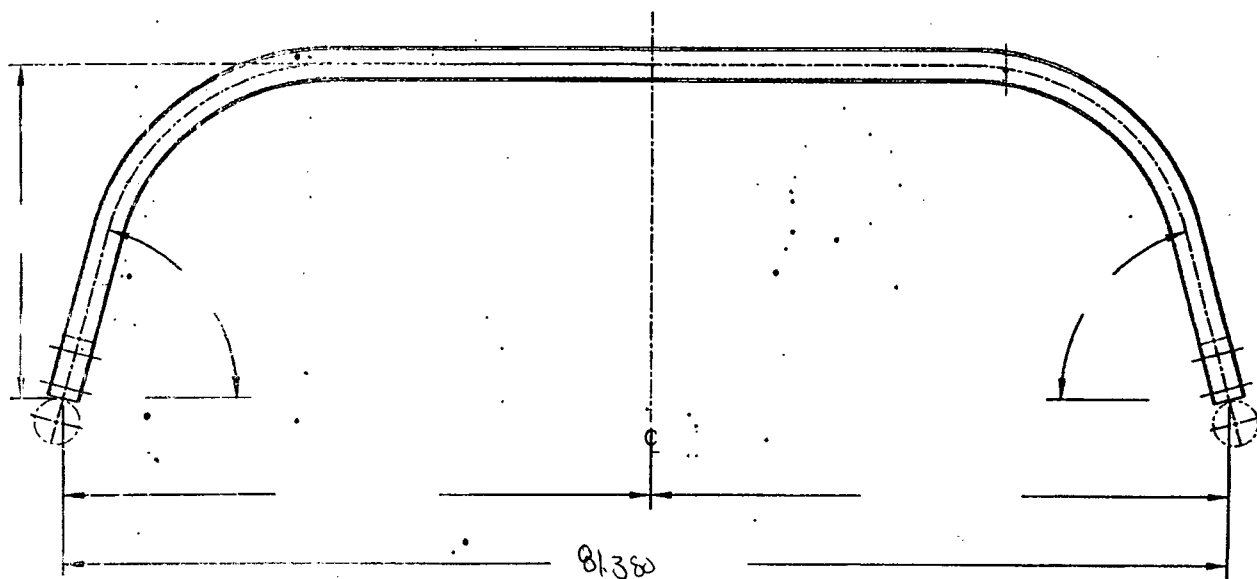
Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	



<b>DART AEROSPACE LTD</b>		<b>Work Order:</b>	
<b>Description:</b> Crosstube High Aft (AS350/355)		<b>Part Number:</b>	<b>D350-748-201</b>
<b>Inspection Dwg:</b> D350-748-241 <b>Rev:</b> E			<b>Page 1 of 1</b>

40.720  
40.640  
81.360

Required Dimension	Min	Max
Height	31.22	31.48
1/2 Span	40.77	41.03
Angle	75	77
Total Span	81.54	82.06



Comments
twist 0.183

QC15 Inspection	
Date	

Rev	Date	Change	Revised by	Approved
A	07.02.03	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	

Item	Qty -241	Part Number	Description
1	X	D350-748-241	CROSS TUBE ASSEMBLY (AS 350/355 HI AFT)
2	1	D6015-125	CROSS TUBE (OR D6018-125)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

#### GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6018-125  
FINISHED LENGTH = 122.700±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-241" AND BATCH NUMBER ON INSIDE OF CUFF  
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 29.85 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) RUN CUTTER OFF PART WHERE INDICATED. BLEND OUT ALL EDGES FROM MACHINING  
LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER  
BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO  
BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO  
VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSS TUBE,  
CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE  
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES,  
NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY.  
CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE  
MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO  
CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT  
NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH TUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN  
CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

83698 MLC  
12/04/24

RELEASED  
2011-01-08

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A8-3); ADD TOLERANCES (ZN C6-3, D2-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6018-125 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN	DP	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
DRAWN	DP		
CHECKED	LS	DRAWING NO.	REV. F
MFG. APPR.	ES	D350-748-241	SHEET 1 OF 4
APPROVED	TH	TITLE	SCALE
DE APPR.	TH	CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	10.11.23	COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

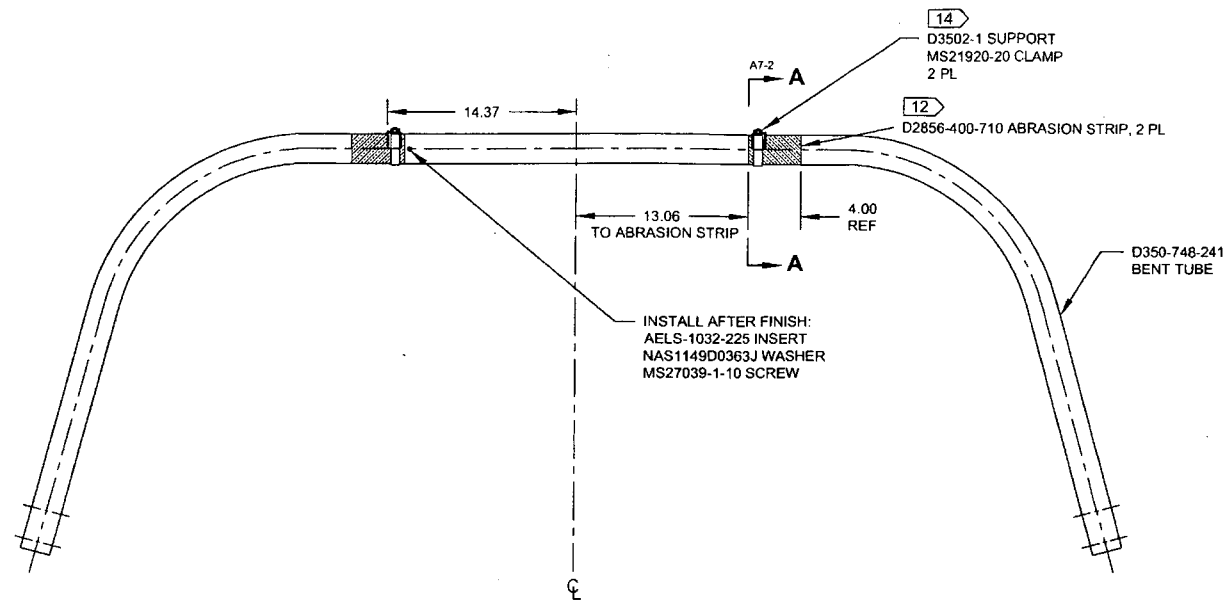
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Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

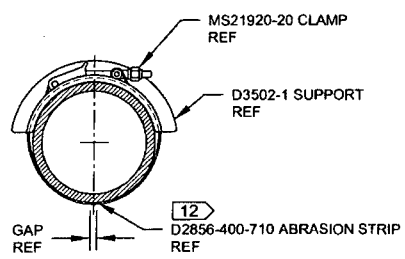
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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

03698



**D350-748-241  
ASSEMBLY DETAIL**



**SECTION A-A D4.2  
SCALE 4X**

**RELEASED**  
2011-05-19  
JMT

DESIGN	97	<b>DART AEROSPACE LTD</b>	
DRAWN	97	HAWKESBURY, ONTARIO, CANADA	
CHECKED	13	DRAWING NO.	REV. F
MFG. APPR.	13	D350-748-241	SHEET 2 OF 4
APPROVED	14	TITLE	SCALE
DE APPR.	14	CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR CORRECT OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

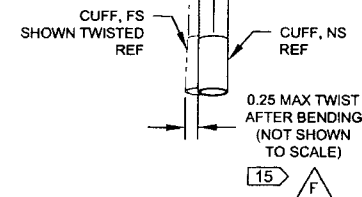
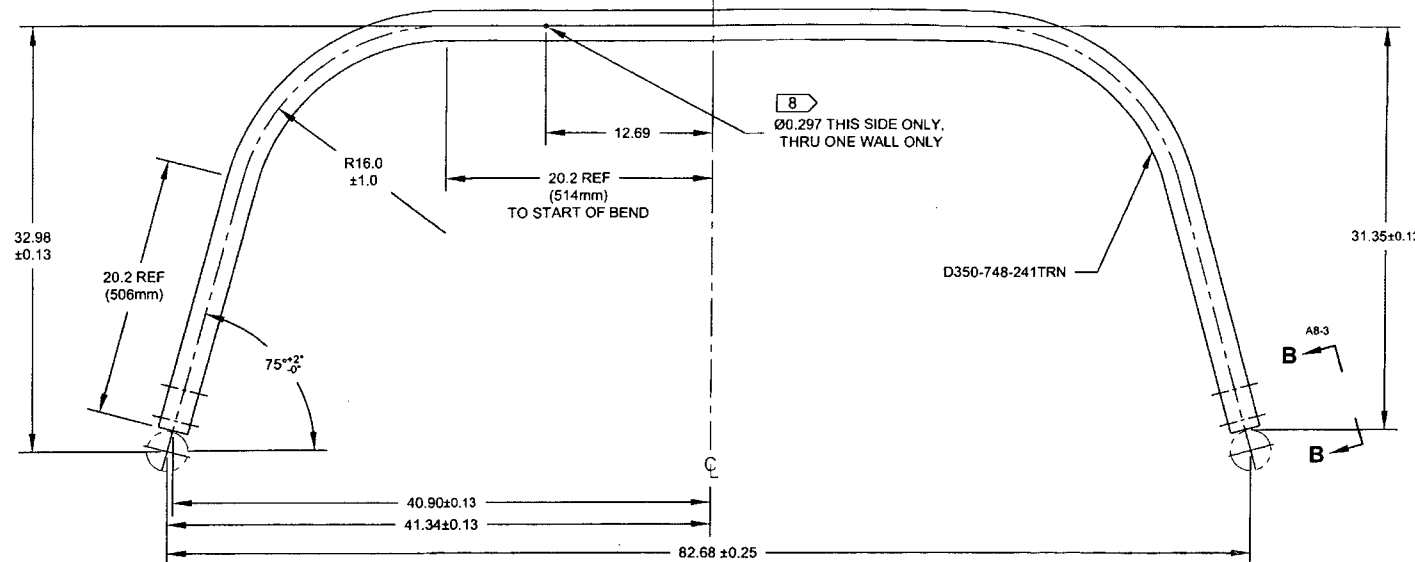
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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

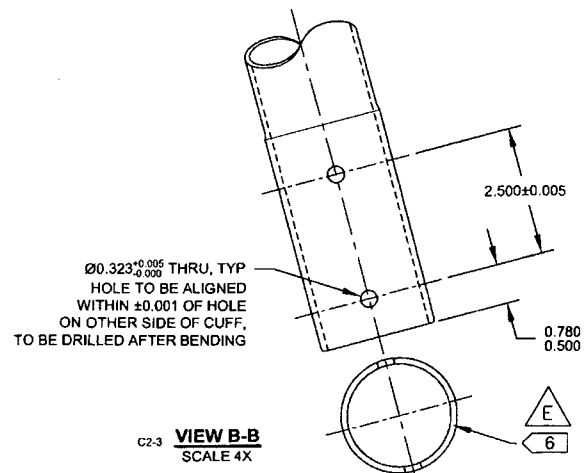
**NOTE:** Date & initial all entries

8 7 6 5 4 3 2 1

83698



**D350-748-241**  
**BENDING AND DRILLING DETAIL** 10



**RELEASED**  
2011-01-18

DESIGN	92	<b>DART AEROSPACE LTD</b>	
DRAWN	92	HAWKESBURY, ONTARIO, CANADA	
CHECKED	1/2	DRAWING NO.	REV. F
MFG. APPR.	1/2	D350-748-241	SHEET 3 OF 4
APPROVED	1/2	TITLE	SCALE
DE APPR.	1/2	CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

8 7 6 5 4 3 2 1

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

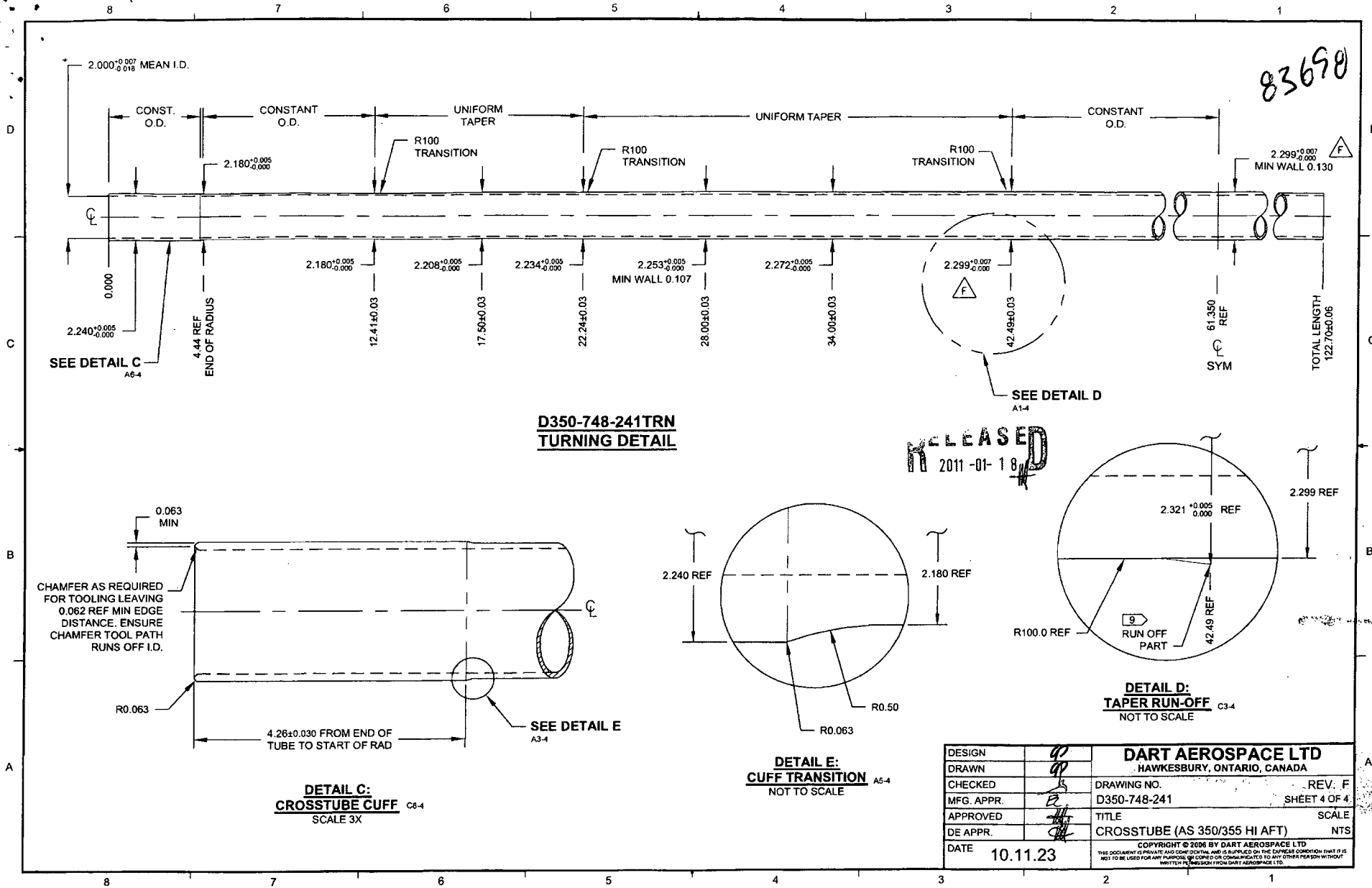
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Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

83698



DESIGN	GP	<b>DART AEROSPACE LTD</b>	
DRAWN	GP	HAWKESBURY, ONTARIO, CANADA	
CHECKED	B	DRAWING NO.	REV. F
MFG. APPR.	B	D350-748-241	SHEET 4 OF 4
APPROVED	TH	TITLE	SCALE
DE APPR.	TH	CROSSTUBE (AS 350/355 HI AFT)	NTS
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# METCOR INC.

560 BOUL. ARTHUR-SAUVÉ  
ST-EUSTACHE, QC, J7R 5A8

Tel: 450-473-1884 / Fax: 450-491-5498

## Certificat de Conformité Détaillé

Detailed Certificate of Compliance

BON DE TRAVAIL order	CHARGEMENT load
175881	1

CLIENT / customer 215

DART AEROSPACE  
1270 ABERDEEN  
HAWKESBURY

ON K6A 1K7

LIVRÉ À / shipped to:

DART AEROSPACE  
1270 ABERDEEN  
HAWKESBURY

ON K6A 1K7

COMMANDE DU CLIENT customer po	BON DE LIVRAISON DU CLIENT customer shipper no.	MATÉRIEL material	CODE DE TRAITEMENT mat'l heat code	NUMÉRO DE LOT lot number
16942		Steel		

### SPÉCIFICATIONS DU PROCÉDÉ

processing specifications

STRESS REL

SAE AMS 2759/1 REV.E

EXIGENCE / requirement	SPÉCIFICATIONS / specified	TESTS EXÉCUTÉS / performed	RÉSULTATS DE TESTS / results
Visual			

QUANTITÉ quantity	POIDS weight	DESCRIPTION DES PIÈCES parts description
7	210	D350-748-101 (1) CROSSTUBE  (1) D350-748-101 CROSSTUBE  (1) D350-748-201 CROSS TUBE  (1) D350-748-201 CROSS TUBE  (1) D350-748-201 CROSS TUBE  (1) D350-748-201 CROSS TUBE  (1) D350-748-201 CROSS TUBE  CONTENANT: 1 PALETTE

Operation	Temp. spécifiée Specified Temp	Temps de trempage Spécifié Specified Soak Temp	Atmosphere	Carbone Carbon Potential	Q-Media Q-Temp	Four # Furnace #	Date Départ Start Date	Heure d'entrée Time In	Heure de sortie Time Out	Date Complétée Date complete
1.00 CONT. INIT.	LAVAGE		si nécessaire							

**METCOR INC.**  
 560 BOUL. ARTHUR-SAUVÉ  
 ST-EUSTACHE, QC, J7R 5A8  
 Tel: 450-473-1884 / Fax: 450-491-5498

**Certificat de Conformité Détaillé**  
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BON DE TRAVAIL order	CHARGEMENT load
175881	1

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DART AEROSPACE  
 1270 ABERDEEN  
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ON K6A 1K7

LIVRÉ À / shipped to:

DART AEROSPACE  
 1270 ABERDEEN  
 HAWKESBURY

ON K6A 1K7

Operation	Temp. spécifiée Specified Temp	Temps de trempage Spécifié Specified Soak Temp	Atmosphère	Carbone Carbon Potential	Q-Media Q-Temp	Four # Furnace #	Date Départ Start Date	Heure d'entrée Time In	Heure de sortie Time Out	Date Complétée Date complete
2,00 PREPARING	COMPTAGE									
3,00 STRESS RE	650	2 hrs 30 minutes	air			701				
4,00 FINAL INSP							05-11-2012			05-11-2012

**COMMENTAIRES / comments**

ALL THE HEAT TREATMENT PROCESSING PERFORMED ON THIS ORDER WAS ACCOMPLISHED USING HEAT TREATMENT EQUIPMENT THAT MEETS THE REQUIREMENTS OF AMS 2759. ALL THE HEAT TREATMENT OPERATIONS WERE ACCOMPLISHED IN ACCORDANCE WITH THE REQUESTED/REQUIRED HEAT TREATMENT SPECIFICATION AND ALL REQUIRED VERIFICATIONS TEST HAVE BEEN PERFORMED AND DOCUMENTED. NO UNAUTHORIZED CHANGES OR DEVIATIONS TO REQUIRED HEAT TREATMENT SPECIFICATIONS OR PROCEDURES HAVE BEEN PERFORMED.

APPROUVÉ par / Approved by:

*[Signature]*



DATE: 2012-05-11

/ Nous certifions que toute l'information comprise sur ce rapport est exacte et conforme aux requis du client. / We certify that all the information on this report is exact and in accordance with the order requirements.

**CERTIFICATE OF  
CONFORMANCE**

**CADORATH PLATING CO. LTD.  
2150 LOGAN AVENUE  
WINNIPEG, MANITOBA R2J-0J1**

**DATE:** Jun-12-2012

**CONSIGNED TO:** Dart Aerospace Ltd.  
1270 Aberdeen St.  
Hawksbury, ON K6A 1K7

**W/O #:** 114963

**INVOICE #:** 60875

**CONTRACT OR  
PURCHASE ORDER #** PO17084

**DESCRIPTION:** CROSSTUBE

**QTY** 1

**P/N #** D350-748-201

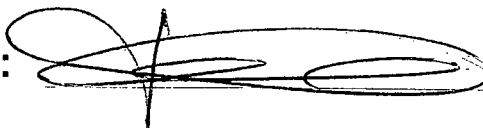
**S/N #** 83698

STRESS RELIEVE HEAT CHART # 12-546. MPI-IAW ASTM-E-1444.  
CADMIUM PLATE IAW AMS-QQP-416C TYPE 2 YELLOW CLASS.  
BAKE HEAT CHART # 12-573. MPI IAW ASTM-E1444.

*8/17/08/13*

**CERTIFICATE:** I certify that the items indicated here on have been inspected and tested and conform to all specifications and requirements detailed on the contract or purchase order.

**Approved Inspector:**







# LIQUID PENETRANT TEST REPORT

P- 12188

PAGE 1 OF 1

NT  
ENTION  
ADDRESS

Dart Aerospace  
MATT/LINDA  
1270 ABERDEEN ST.  
HAWKESBURY, ON

DATE

June 19/2017 TIME AM ☒ PM ☐

ACUREN JOB NO.

190-12-0265

PO/NO No.

17084

WORK LOCATION

SAVE

ACCEPTANCE STD

ASTM 1417/BS 1038 REV./DATE 2005

PROJECT

F.P.I. on cross tubes

ITEM(S) EXAMINED

(6) Pcs

SEE RESULTS

JOB DESCRIPTION

PROCEDURE No. LT002 REV./DATE 2008

TECHNIQUE No. LV 2 REV./DATE 2008

PART NO.

SEE RESULTS

MATERIAL 4130 STEEL THICKNESS VARIOUS

SCOPE

A wet fluorescent liquid penetrant examination  
was completed 100% on external surface

TEST DETAILS

METHOD ☒ FLUORESCENT ☐ VISIBLE ☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED  
FAMILY BRAND MAGNAFLUX BLACK LIGHT S/N 16459 ☒ OUTPUT > 1000  $\mu$ W/cm<sup>2</sup> ☐ AMBIENT < 2 fc  
PENETRANT 2-LG7 MINIMUM DWELL TIME 45 MIN. LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURF.  
PENETRANT REMOVER H2O MINIMUM DRY TIME >10 MIN. OTHER LAB. NO  
DEVELOPER SKD 52 MINIMUM DWELL TIME 10 MIN. LIGHT METER S/N 1098866 CAL DUE DATE July 2017  
DEVELOPER TYPE ☒ NON AQUEOUS ☐ AQUEOUS ☐ DRY

TEST SURFACE

SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☒ MACHINED ☐ SHOT BLASTED ☒ CLEAN BARE METAL  
SURFACE TEMPERATURE ☐ < -4°C/20°F ☐ -4°C/20°F TO 10°C/50°F ☒ 10°C/50°F TO 52°C/125°F ☐ > 52°C/125°F

RESULTS-

☒ METRIC ☐ IMPERIAL

W.O.#s - CROSS TUBES.

1	-	"	"	83701	✓
1	-	"	"	83699	✓
1	-	"	"	83698	✓
1	-	"	"	81517	✓
1	-	"	"	81518	✓
1	-	"	"	84380	✓

12.06.19

## Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is acknowledged that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions. data for other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

## Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES

CLIENT REPRESENTATIVE

Matthew Murdoch

PRINT

SIGNATURE

DTR # E 63501

TECHNICIAN (SIGNATURE):

Mike Lattin

NAME (PRINT):

1<sup>ST</sup> TECHNICIAN

2<sup>ND</sup> TECHNICIAN

CGSB LEVEL 1 SNT LEVEL

CGSB LEVEL SNT LEVEL

CGSB REG. No. 60606

CGSB REG. No.

REPORT

REVIEWED BY:

NAME

INIT

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